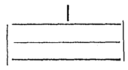
over the roller W, and then between the rollers G and H. The rollers F and H are the same size; but G is larger, and has a ratchet-wheel at its end. E is a rod joining D at D'. At the lower end of E is a ratchet-catch K, pressed upon by the spring L, which is also fastened to E. S is a rod fastened to D, and has on its lower end a wide framework  composed of horizontal slats. Between these slats pass the indicator or pointer of an aneroid barometer B, and a metal thermometer A. These pointers are made longer than usual, and have attached a needle-point at right angles in the vertical, as shown by P' and P. This whole apparatus is mounted on a frame or board, and put into a basket suspended from the lower end of a balloon. The three wires below are fine wrapped wire, and serve to hold captive the balloon as well as to cause the self-registrations to be made, by aid of the battery X at the ground. Let the balloon ascend, say 100 feet; then put 1 on 2-3, and N draws D down. This pushes E down (and the ratchet-catch glides over the teeth on G), and pushes S down also. This last causes P' and P to puncture the paper. Now open 2-3 and close 2-4; then N' draws D up, S is pulled up, and the points P' and P are freed. Also K catches on G, and draws off some paper from c, the paper being drawn between F G, over W, and between G H. Then the holes pricked by P' P are out of the way, and other holes can be punctured at another elevation of 100 feet for the balloon. A fixed pencil is also pressed against the paper at each observation, as a reference-point for the puncture by the index-point.

For the hair hygrometer we should have another pointer, P''. A small anemometer can be suspended from beneath the basket, and kept vertical by means of a weight. This anemometer causes a contact arrangement to close for an instant for every 100 feet of wind-motion. The two wires from the anemometer terminate at n and n', and, when the magnet N' is not attracting the armature, the points n and n' are free. When the current is passed through N', then n comes in contact with o, and n' in contact with o'; o and o' being joined to the wires 4 and 2, which run to the reel at the ground. At the ground we insert a telephone or a galvanometer in the wire 4.

The normal condition of the apparatus will be with the current passing through N', and the battery X will cause the galvanometer to give a constant reading; but, for every hundred feet of wind, the anemometer will close its circuit for an instant, and the dividing-up of the current at Z Z by including the anemometer in the circuit will cause a momentary deflection of the galvanometer (or will cause a slight sound in the telephone), and the observer can time these with a watch, and get the wind-velocities whenever he wishes them.

In place of N we could insert a spring, and do away with the wire 3, and probably various other changes would suggest themselves to any one actually constructing the apparatus.

FRANK WALDO.

Cincinnati, O., June 27.

Sea-sickness.

WITH regard to the subject of sea-sickness, treated of in an article in *Science*, June 3, I beg to offer a few remarks.

As to the causation of the affection, the process is a gradual one, affecting the balancing sense, which is not interfered with in the case of iron-plate workers. The sickness affecting these workers is caused by the successive shocks due to the hammering, and differs from sea-sickness in character and causation.

An article of mine in the *Lancet* of June 28, 1884, defines sea-sickness as follows: "The altered sensory impressions affecting those at sea interfere with the co-ordination of movements by which the body is adapted to its surroundings, and with the vomiting and other centres in the *medulla oblongata*. This interference causes sea-sickness."

The balancing of the body depends on the ordinary sensory impressions, and also on what Foster calls 'the afferent impulses, as it were, of a new sense,' from the semicircular canals, arising from variations of pressure in their ampullæ. With reference to the recent paper of Dr. James, the following quotation from my article above mentioned may be of interest: "In cases where the internal ear has been injured by otorrhœa following scarlatina or measles, we may suppose that the person learns to balance himself without the intervention of this new sense, the absence of which is compensated for in some way; and it is a curious fact, and one which throws considerable light on the etiology of sea-sickness, that such persons invariably escape this disease. . . . That deafness in itself does not prevent sea-sickness is in keeping with the fact that the afferent impulses from the semicircular canals do not give rise to auditory sensations" (*vide* Foster's 'Physiology,' 2d ed. p. 495).

It is reasonable to believe that no structural change takes place in the semicircular canals, due to the motion of the endolymph, else the longer the motions continued, the more marked would become the sickness. The altered impressions affect the brain directly, and sea-sickness is prevented by their action from being mollified or nullified by the educated conscious ego.

As to drugs, atropine has a sedative action on the *medulla*, etc., and renders the altered sensory impressions inoperative in producing sea-sickness. It should be given in drop doses of the liquor atropine, B.P., in a teaspoonful of water, every hour, till the physiological effect of the drug is produced.

The bromides have also a sedative action on the brain, but, to prevent sea-sickness, must be given in sufficient doses to produce bromism. As this is a serious condition, and one likely to affect the patient's reason and general health most injuriously, the bromides should be used with great caution, and only when prescribed and their action watched by a medical man.

T. T. REYNOLDS.

Steamship 'City of Chicago,' Jersey City, July 1.

The Function of Nitrogen in Manures.

IN works on agricultural chemistry it is usual to classify manures or plant-food substances as nitrogenous matter, phosphates, and potash; but, while the phosphates and potash enter into the substance of every part of the plant, the amount of nitrogen found in the cereals and food-plants generally is inconsiderable.

A few food-plants contain nitrogen as an essential element of their substance: thus pease contain from two and a half to three and a half per cent, and tea-leaves from five to eight per cent; but in the case of all these plants it is well known that they are capable of drawing the necessary supply of nitrogen from the atmosphere.

Without entering on the question of whether the small traces of nitrogen found in the substance of food-plants generally are essential or accidental, or that other question whether all plants requiring nitrogen are, like animals, capable of deriving it from the air, it is very safe to infer, from the slight trace of nitrogen found in the cereals and food-plants generally, that the ammonia, or nitrogenous substance convertible into ammonia, which is necessary to secure a good crop, has some other and more important function to perform than that of supplying nitrogen to the plant. It may be doubted, even, whether nitrogen is a plant-food for the cereals, or in any way essential to their proper development; but hydrogen, the other element of ammonia, is one of the prime constituents of all vegetable substances, and I infer that it is the easily liberated hydrogen in the ammonia that gives it its manurial value. The function of the nitrogen is simply that of a carrier of hydrogen.

Let me explain. The substance of all trees and plants, wood, stalk, bark, leaves, fruit, etc., is a chemical compound of the three elements, oxygen, hydrogen, carbon. The tree or plant absorbs carbonic acid from the air, which gives it two of the three essential elements, carbon and oxygen. It also takes up water, which is a compound of oxygen and hydrogen, by the roots; and by the mysterious chemistry of organic life, the water and carbonic acid being decomposed on contact, the liberated hydrogen and carbon unite with a portion of the oxygen into definite chemical combinations, the new substance arranging its atoms as cell-contents or cell-walls. All the oxygen of the water, with a portion of that from the carbonic acid, is liberated, and returned to the atmosphere. Given air, water, and potash, and a soil mechanically suitable, and we have all that is necessary to the full and healthy development of timber and fruit trees, flowering plants, and in fact almost every species of vegetation except the grasses, cereals, and principal food-